

MARS DIGITAL TERRAIN MODEL

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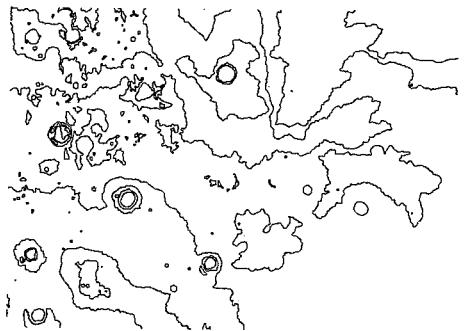
The Mars Digital Terrain Model (DTM) is the result of a new project to (1) digitize the series of 1:2,000,000-scale topographic maps of Mars, which are being derived photogrammetrically under a different project (Wu et al., 1985), and (2) reformat the digital contour information into rasters of elevation that can be readily registered with the Digital Image Model (DIM) of Mars (Batson, 1986). Derivation of DTM's involves interpolation of elevation values into 1/64-degree resolution and transformation of them to a sinusoidal equal-area projection. Digital data are produced in blocks corresponding with the coordinates of the original 1:2,000,000-scale maps, e.g., the dimensions of each block in the equatorial belt are 22.5° of longitude and 15° of latitude. This DTM is not only compatible with the DIM, but it can also be registered with other data such as geologic units or gravity. It will be the most comprehensive record of topographic information yet compiled for the Martian surface. Once the Mars DTM's are established, any enhancement of Mars topographic information made with updated data, such as data from the planned Mars Observer Mission, will be by mathematical transformation of the DTM's, eliminating the need for recompilation.

Experimental work has begun on the subquadrangles MC-8NW and MC-9NW, following two different procedures. In the first procedure, for MC-8NW, the digital contour data in the Mercator projection (Fig. 1a) were interpolated to produce a digital terrain model (Fig. 1b), and then the resulting rasters were transformed into the sinusoidal projection (Fig. 1c). Following the second procedure, for MC-9NW, digital contour data were directly transformed into sinusoidal projection (Fig. 2a), and then the transformed contour data were interpolated (Fig. 2a) into rasters with the same projection (Fig. 2b). This second procedure eliminates one step, and thus saves computer time and preserves resolution, particularly for those maps having dense contour lines. Its only disadvantage is that no file can be established for digital contour data in the Mercator projection. Either procedure can be employed for the DTM's, although, as noted, the second one is more practical where the density of contour lines is high.

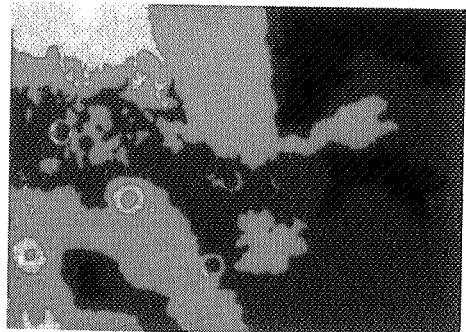
In fiscal year 1987, completion of DIM's for 50 Mars subquadrangles is planned. Fifty more DTM's are scheduled for completion in FY-88 and an addition 40 in FY-89.

References

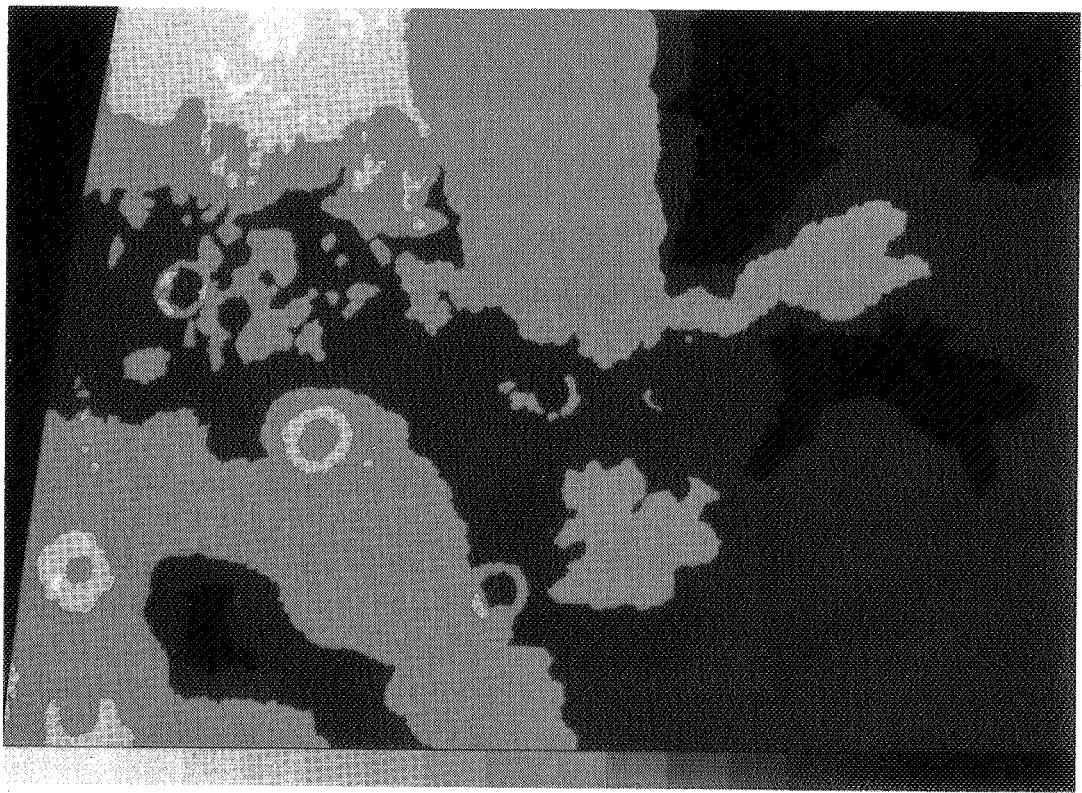
Batson, R. M., 1986, A digital image model of Mars, in Reports of Planetary Geology and Geophysics Program-1985, National Aeronautics and Space Administration Technical Memorandum 88383, p. 577-579.
Wu, S. S. C., Jordan, Raymond, and Schafer, F. J., 1985, Compilation of the Mars 1:2,000,000-scale topographic map series, in Reports of Planetary Geology and Geophysics Program-1984, National Aeronautics and Space Administration Technical Memorandum 87563, p. 612-613.



(a)

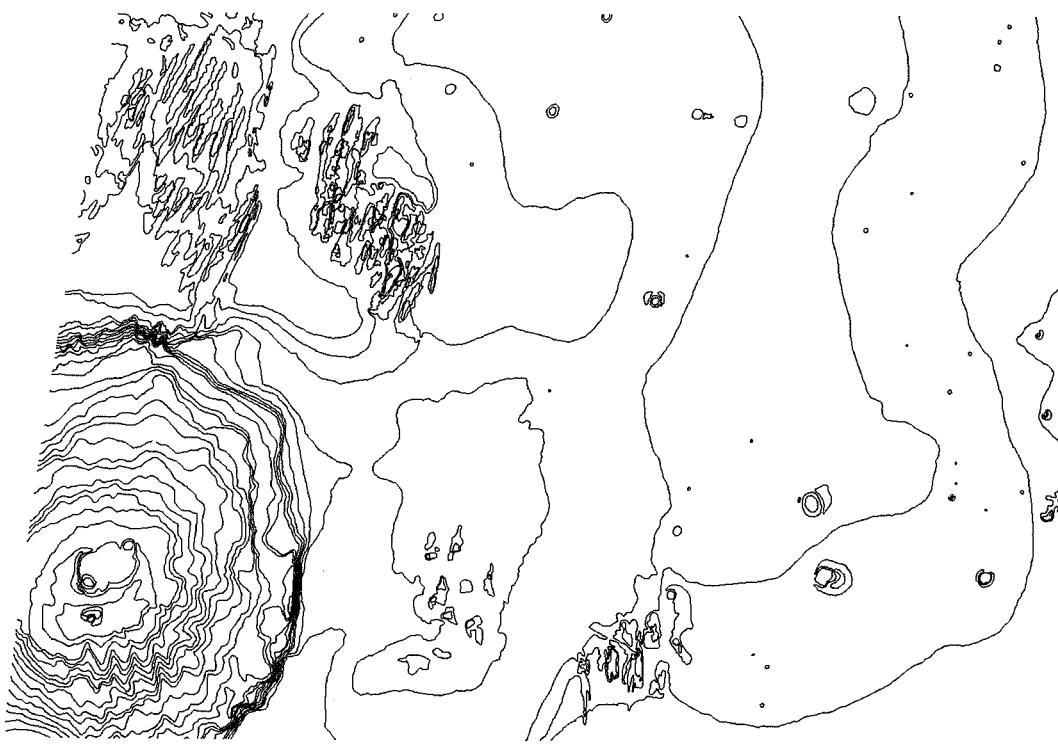


(b)

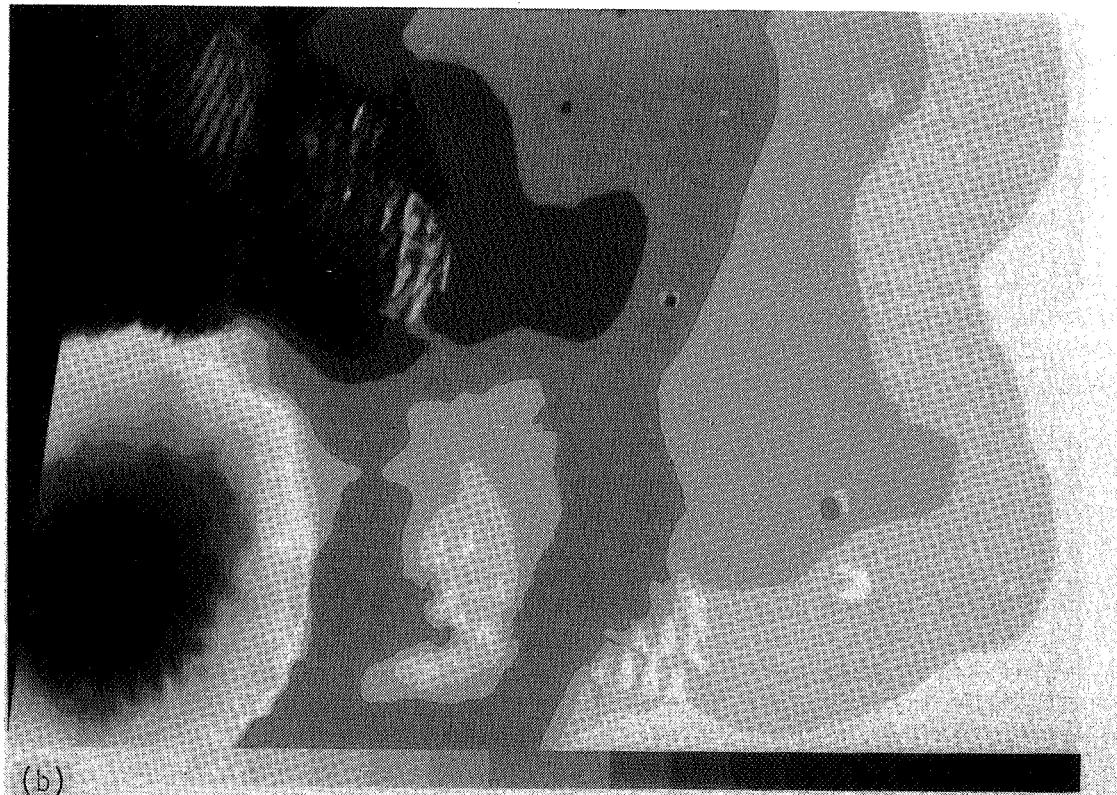


(c)

Figure 1. Digital terrain model of the northwest part of the Coprates quadrangle (MC-18NW) of Mars. (a) Digital contour data in Mercator projection, (b) digital terrain model in Mercator projection, (c) digital terrain model in sinusoidal equal-area projection.



(a)



(b)

Figure 2. Digital terrain model of the northwest part of the Margaritifer Sinus quadrangle (MC-19NW) of Mars. (a) Digital contour data in sinusoidal equal-area projection, (b) digital terrain model in sinusoidal projection.